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Title page

Title: The effect of yoga on menstrual disorders: a systematic review

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Abstract

Objective: To summarise and evaluate evidence for the effect of yoga on menstrual disorders.

Methods: PubMed, Cinahl/ Medline, Web of Science, AMED and Scopus were searched for english language literature relevant to the review question. All primary research studies were included. **Results:** 15 studies, described in 18 papers were included in the review. A range of yoga interventions were used. Some studies used a combination of asana, pranayama and other yogic relaxation or meditation techniques. The included studies all reported some change in their outcome measures suggesting reduced symptoms of menstrual distress following a yoga intervention, however the heterogeneity and intensity of the interventions and outcome measures meant that findings have limited generaliseability and applicability in practice settings. **Conclusions:** further research on the relationship between yoga practice and menstrual disorders is warranted, but there must be both a consistency in the methodology, measures and quality of studies as well as a shift towards research on yoga practices that are replicable outside of the clinical trial setting.

Introduction

This paper reviews the evidence for the effect of yoga practice on common menstrual disorders in premenopausal women. Common primary menstrual disorders include: amenorrhea (lack of menstruation), oligomenorrhea (irregular menstruation), dysmenorrhea (painful menstruation), premenstrual syndrome (PMS), which incorporates cyclical psychological and physical symptoms) and premenstrual dysphoric disorder (a severe form of premenstrual syndrome)¹. Menstrual disorders are common. Prevalence of PMS and premenstrual dysphoric disorder has been reported as being between 5 and 8%². Prevalence rates for dysmenorrhea range from 16% to 91%.³ Surveys of women in developing countries, America, Europe and Australia have found that 5-20% of women report dysmenorrhea to the extent that it stops them from participating in usual activities.⁴ Menstrual disorder is also a component of the Female Athletic Triad (along with osteoporosis and disordered eating), the prevalence of which among female athletes is between 0 to 15.9%.⁵ Where medical assessment and treatment of menstrual disorders should in the first instance establish whether they are secondary to other conditions, such as polycystic ovarian syndrome, thyroid problems, menopause or pregnancy⁶, many women choose to manage their menstrual problems through the use of complementary and alternative therapies, including the practice of yoga^{7,8,9}

Background

Yoga is a term used to describe a variety of practices, although its literal translation in Sanskrit means 'yoke' or 'union'.¹⁰ Yogic practices may include physical exercises (asanas), breathing exercises (pranayama), relaxation techniques and meditation or concentration practices, including Yoga Nidra (a form of guided relaxation practice). **There are many different types of yoga,**

according to different schools or traditions, for example the asana-heavy styles of yoga practiced often in the West according to the teachings of three pupils of Krishnamacharya (1889-1989): the school of BKS Iyengar¹¹, Ashtanga Vinyasa Yoga of Patthabi Jois¹² and the Viniyoga of Desikachar.¹³ Yoga practice in the modern context is primarily focused on asana as a physical exercise regime, whereas traditionally, and certainly prior to the mid-20th century, yoga is a term more widely associated with spirituality and contemplation, with asana practice being a less prominent aspect.¹⁴ Research on yoga as a therapeutic intervention grows apace^{15,16,17} although the variability in study quality, interventions and outcome measures means that the extent to which yoga practice may positively affect health cannot yet be definitively stated.^{15,16} The mechanism by which yoga may improve health is commonly considered to be its effect on the autonomic stress response.¹⁸ Yoga-based practices have been shown to affect a complex series of physiological and cognitive mechanisms, which in turn may impact on aspects of self-regulation of stress.^{19,20,21} A recent attempt to define a comprehensive theoretical framework from which hypotheses regarding how bottom-up neurophysiological and top-down cognitive mechanisms may explain the impact of yoga on wellbeing has differentiated between the effects of the movement, breath and attention aspects of practice.¹⁹ It has also differentiated between a number of neuro and physiological processes that may be involved in self-reported changes in wellbeing of yoga practitioners. These include: the impact of yoga movement on the basal ganglia and cerebella circuits; the influence of yoga breathing practices on concentrations of oxygen and carbon dioxide in the blood and; the effect of the attention element of practice, akin to other meditative activities, on structural changes in parts of the brain responsible for bodily awareness.

Alongside the exponential increase in yoga research, there has been 'a parallel surge' in yoga practice.¹⁶ Demographic surveys of yoga practitioners in the US have found yoga practitioners to be more likely to be white, female, highly educated and middle aged.^{22,23} As well as the trial

based evidence that yoga may positively affect health, in particular the psychology and physiology of stress, there are practical benefits to suggesting yoga as an intervention for menstrual disorders, in that it is not costly, requires no equipment and is readily available (there are classes in most cities, and yoga tutorials are available online). A recent meta analysis of clinical trials found yoga to be as safe as usual care or exercise.²⁴ A relationship between yoga asana practice and menstrual disorder symptoms has been established in both the non academic popular literature and in yoga manuals. In the grey non-academic literature (namely the plethora of yoga websites and magazines, and mentions of yoga on health and wellbeing sites) there is evidently an association between frequent yoga practice and oligomenorrhea, and the possible effects of yoga on menstrual disorders (a Google search of 'yoga AND menstrual disorders' yielded 'About 340,000 results' on 6 Nov 2016 and 'yoga AND oligomenorrhea' yielded 'About 36,000 results on 6 Nov 2016). Commonly in yoga manuals and instructional articles, women are advised to refrain from certain asanas, such as the inversion postures Sirsasana (headstand) or Sarvangasana (shoulder stand) during menstruation²⁵, whereas in the Ashtanga Vinyasa tradition of Patthabi Jois¹² women are advised to refrain from asana practice in the first three days of menstruation off from practice.²⁶ Popular yoga manuals offer women specific sequences to be undertaken during menstruation, for example, Geeta Iyengar's Yoga: A Gem for Women²⁷ recommends a sequence including Upavistha Konasana and Baddha Konasana to ease dysmennorrhoea and Judith Hanson Lasater offers a sequence for menstruating women in her 'The Moon club: Honouring the Monthly Cycle'²⁸, which aims to: assist the body in releasing menstrual flow, reducing fatigue and moderating hormonal shifts. Like Iyengar, her sequence is based around versions of Baddha Konasana and Upavistha Konasana. The sequence of postures recommended online Yoga Journal for menstruation²⁹ include: Baddha Konasana, Dhanurasana (the bow), Setu Bandha Sarvangasana (bridge pose), Ustrasana (the camel), dolphin and Adho Mukha Svanasana (downward dog). The PopSugar lifestyle site article: 'Skip the ibuprofen and do these yoga poses to ease period pain'³⁰ suggests a 'half bound squat'

(Malasana), arching pigeon (Kapotasana), one-armed camel (Ustrasana) and a wide child's pose (Balasana) and a reclining twist (it is probably worth noting that the first three of these poses are rather advanced and would probably not be taught in a beginner's class).

The aim of this review was to assess the evidence for correlations between yoga practice and various forms of menstrual disorder and to identify which forms of yoga have been evaluated as interventions for menstrual disorders. The review also aimed to evaluate the published primary research evidence for the efficacy of yoga as an intervention for treating menstrual disorders. Does published research evidence accord with yoga wisdom, as reflected in journals, webpages and instructions manual?

Methods

This study was a systematic literature review of primary research on the impact of yoga on menstrual disorders.

A search was conducted of the English language literature between 1996 and 2016. The following databases were searched: PubMed, Cinahl/ Medline, Web of Science, AMED and Scopus, using the following terms: Yoga AND menstruation OR menstrual period OR menarche; Yoga AND amenorrhea; Yoga AND dysmenorrhea. Studies were included if the following criteria were met: primary research; on premenopausal women; undertaking yoga practice. Studies were excluded: if their participants were menopausal women; if yoga was not the intervention being undertaken; if not primary research. This study aimed to comprehensively review all research literature on the impact of yoga on menstruation, not just RCT evidence, so all types of primary research study were included.

One reviewer reviewed each paper using a standardized data extraction form. Extracted data included authors, year of publication, sample size, interventions, main outcomes, and adverse events. The data extraction process is detailed in Figure 1.

The methodological quality and risk of bias of the included studies were measured using the Critical Appraisal Skills Programme (CASP) criteria³¹ and the Cochrane Handbook for Systematic Reviews of Interventions (Version 5.0.2).³² The domains of bias that were reviewed were: random sequence generation, allocation concealment, blinding of participants and personnel, incomplete outcome data, selective reporting, and other sources of bias.

Results

15 studies, described in 18 papers were included in the review. The year of publication, authors, study design, sample size, age of participants, intervention modality, intervention dosage, outcome measure and salient findings for each study are reported in Table 1. Three were case controlled trials comparing women with menstrual disorders and healthy women. Nine studies were randomised controlled trials (RCTs). Three were intervention studies. Eight studies were conducted in India. Three studies were conducted in Taiwan. There was one study each from Iran, Japan and Korea. The included studies measured the effect of yoga on premenstrual symptoms and menstrual distress. No studies were found that measured the effect of yoga on amenorrhea or oligomenorrhea. No studies measured the effect of yoga on menstruation in women who were regular yoga practitioners.

Participant characteristics and recruitment

The age range of women included in the studies varied between 13 and 45. In two studies participants were adolescent girls who attended residential colleges^{33,34}. Other studies recruited participants through referral from and attendance at gynaecology clinics,^{35,36,37,38,39,40} on students at a metropolitan college,⁴¹ students on a physiotherapy course,⁴² female volunteers with no stated specific origin,⁴³ unmarried medical students,⁴⁴ students,⁴⁵ nursery and kindergarten teachers⁴⁶, staff and students at a university,⁴⁷ female workers at an electronics factory,⁴⁸ college students,⁴⁹ nursing college students.⁵⁰

Interventions

A range of yoga interventions were used. Some studies used a combination of asana, pranayama and other yogic relaxation or meditation techniques. Two studies^{35,36,38,39} measured the sole impact of Yoga Nidra practice. In one study⁴⁶ the **effect of three specific yoga asanas (cobra, cat and fish)** was measured. In other studies a range of asana were practiced. The length of the yoga practice sessions differed between studies, from 10 minutes⁴² to 90 minutes.⁴⁰ Frequency of practice ranged from daily for 16 weeks⁴⁰ to 20 minutes for 14 days.⁴⁵ In one study⁴⁶ participants were taught the asana routine then given a DVD to use for home practice. In the other studies instruction was provided in a class setting. One study⁴² compared the efficacy of two pranayama techniques. In one study³⁴ the control group undertook non yogic exercise, breathing and rest at the same time as the yoga intervention group. The control groups in the other RCTs and case control studies did not take part in a control intervention.

Outcome measures

There was little consistency between studies in the outcome measured used. In some studies versions of the Moos Menstrual Distress Questionnaire (MDQ)⁵¹ was used, in others pain

scales, primarily the Visual Analogue Scale for Pain (VASP)⁵² and general quality of life and stress scales were used (see Table 1). Mood scales and mental health scales were also used. In some studies physiological assessments were used as objective measures of impact, and to identify underlying mechanisms for the potential impact of yoga on menstrual distress. These included the use of resting EEGs; BMI, hand grip and reach tests autonomic function tests and serum levels of hormones at certain points in the menstrual cycle.

Findings

All studies reported a beneficial effect of yoga as an intervention for menstrual disorders. Yoga practice was associated with lower MDQ scores;^{41,50} lower serum homocysteine⁴¹; lower negative affect⁴⁰; reduced pain scores;^{42,43,44,48} increased wellbeing scores;^{38,43} autonomic system changes;^{33,35,36,37} a heightened relaxation response;⁴⁷ decreased menstrual disorder symptoms⁴⁸. No study concluded that yoga had no effect on menstrual disorder symptoms.

Only one study³⁸ reported an adverse effect of the yoga intervention, namely one participant dropped out due to 'non-restorative sleep' following the Yoga Nidra practice. Only three studies confirmed no adverse effects of the practice (because of reporting the included studies.^{40,45,49} In all other studies there was no mention of adverse effects or affirmation of their being no adverse effects.

Quality of studies

The quality of studies was assessed using CASP criteria.³¹ All studies gave clear statements of their methodology and aims. Recruitment strategies, data collection and analysis methods were stated. Two studies^{39,40} did not state that it had been approved by an ethics committee or institutional review board. All studies described the use of appropriate statistical analysis techniques.

Whilst the research methodology and aims were replicable, description of the yoga intervention used was variable, limiting the replicability of the intervention in future research. Most studies described the specific asana used in their intervention, with the exception of Nidhi et al³⁴ and Sakuma et al.⁴⁶ The studies focused on Yoga Nidra as an intervention^{35,36,37,39} did not give detail of how Yoga Nidra was instructed or performed. There was limited discussion of the rationales for the specific asana and pranayama chosen for the interventions.

High risk of bias was identified in three studies^{33,40,48} (see Table 2) due to high attrition rates, lack of description of randomisation methods and sole use of subjective self report methods to measure outcomes. Given the nature of the interventions it was not possible to blind participants to their allocation or the intervention. Where several studies used self report measures , such as pain analogue scales, there was a risk of bias in outcome assessment.

Whilst all studied reported some positive impact of yoga on menstrual distress, as reported by participants and as found by assessing physiological correlates of menstrual distress, the external validity of the studies is limited by the frequency of the interventions used, with daily practice under instruction being an unrealistic expectation of most working age women. This concern has also been raised in a review of yoga for menopausal symptoms.⁵³ No studies included long term follow up, meaning that the continued effect of the intervention was not measured.

Discussion

Yoga is a term used to describe a range of practices, following a number of traditions of schools.¹⁰ The findings of this review mirror those of systematic reviews of yoga for other health conditions, in that the positive outcomes of individual studies must be countered by concerns

about their lack of replicability and their heterogeneity.^{12,48,49} Yoga practice is growing exponentially²⁴, particularly in the population most likely to suffer menstrual distress: women of childbearing age. The complex mechanisms by which yoga practice may affect the person cognitively and physiologically, with an assumed impact on the 'stress response' have been noted earlier.^{19,20,21} The effect of yoga specifically on the underlying mechanisms of menstrual disorder is therefore hard to determine here. The reduction of menstrual disorder symptoms (as reflected in pain or wellbeing scores) may be due to a generic effect of yoga on pain tolerance and stress reduction, rather than an impact on underlying causes of menstrual disorder, such as hormone imbalance, for example.

Whilst the studies did discuss the possible and previously trialled benefits of yoga there was no rationale for the specific regimes that were followed, neither the sets of postures used in the interventions nor the duration and frequency of the intervention. In the studies where a limited and specific practice has been followed, for example, Yoga Nidra^{35,36,37,38,39} or the comparison of two types of Pranayama⁴², there was not a justification for these practices over others in the yoga pantheon. The exception is Rakhshae et al's study⁴⁵, using three specific poses. Their use is justified because of the action of the cobra pose on spinal flexibility and muscular strength, the cat pose on movement and breath coordination, and the fish pose on relief of stiffness and improvement of flexibility. The mechanism by which these proposed effects addresses menstrual disorder requires further inquiry though.

The included studies all reported some change in their outcome measures suggesting reduced symptoms of menstrual distress following a yoga intervention, however there was considerable variation in the interventions and outcome measures used. Several studies documented the effect of intensive programs of daily yoga that may be difficult to sustain outside of the college or industrial settings of the studies, whereby the same groups of women could be present in the

same place for several days in a week. Between the 18 studies there was limited parity of intervention or outcome measure. Most studies measured the effect of yoga on an intervention group with no prior experience of yoga practice, meaning that the influence of yoga on menstruation over the long term or in regular practitioners was not gauged. Frequency of practice is a predictor of good health and high subjective wellbeing in established practitioners²², however, the regimens described for yoga novices in some studies in this cohort were particularly intensive^{33,34,40,43,44}. There is scope for future research that both controls for the effect of frequency and duration of practice on menstrual disorders, and explores the specific influence of frequency and duration.

Another main methodological drawback is lack of comprehensive reporting of trial methodology and heterogeneity of interventions, as has been identified in reviews of yoga for depression,^{54,55} weight management,⁵⁶ and menopausal symptoms.⁵³ A recent comprehensive review of research on yoga 2010 to 2016 concluded that RCT studies should compare yoga to other forms of exercise and that physiological tests to identify underlying mechanisms should be used rather than self reported measures.¹⁵ Recent systematic review and meta analyses of yoga intervention studies for physical and mental health conditions have also called for a more sophisticated approach, whereby aspects of the practice and characteristics of different practitioners are explored.

Strengths and Weaknesses.

This was the first systematic review of studies of yoga and menstrual disorders in women of childbearing age, including randomized controlled trials. A limitation of this review was the lack of eligible studies and lack of similarity between studies. Another limitation was the restriction to

english language studies. There was no research available on amenorrhea and yoga or oligomenorrhea and yoga. Evidence from yoga manuals, internet searches and the non academic literature suggests that the effect of yoga practice on menstrual disorders may well extend beyond it being a possible treatment, and that frequent practice may be implicated in the genesis of menstrual disorders as well as potentially relieving them. Such a relationship has not been explored in primary research.

Implications for Further Research.

The results of the studies included here suggest that further research is warranted. There is a need for consistency of measurement and intervention in studies of the efficacy of yoga for menstrual disorders. Long term follow up should be included in research designs. The effect of different aspects of yoga practice (asana, pranayama, Yoga Nidra, relaxation and meditation) as well as the different styles of yoga should be compared, rather than treated as one intervention. Yoga interventions should be designed to be realistically followed by working age women, in order that they may be generalised to the wider population. There have been no studies in this field on Western women. There have been no baseline studies measuring the presence of menstrual disorders in regular yoga practitioners. Of particular interest is the extent of amenorrhea or oligomenorrhea in frequent practitioners of the more strenuous forms of yoga, such as Ashtanga.

Future studies should follow rigorous reporting and methodological standards, meaning that their design should address risks of bias, particularly in randomisation, outcome measures used and reporting bias. The challenge of allocation concealment and blinding of participants should be acknowledged.

Conclusion

This systematic review found a number of studies presenting evidence for the effectiveness of yoga as an intervention for symptoms of menstrual disorder. There was a lack of consistency in the interventions and outcome measures used precluding meaningful meta synthesis. There have been no studies looking at the long term effects of yoga practice on menstrual disorders or of prevalence of menstrual disorders in long term yoga practitioners. The results of this review suggest that further research on yoga for menstrual disorders is warranted, so long as both methodological standards are met and the study design enables generalisability to the target population.

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